

# INTERNATIONAL BACCALAUREATE

## BIOLOGY

Higher Level

Thursday 9 May 1991 (morning)

Paper 3

2 hours

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### INSTRUCTIONS

*Answer TWO questions. Credit will be given for clear, labelled diagrams.*

*Each question carries the same number of marks. The number of marks awarded for each part of each answer are indicated thus: [italic number] e.g. [6]. The total marks awarded for each question is [20].*

1. Insulin is a protein synthesised and secreted by the islets of Langerhans cells in the pancreas.
  - (a) Where in the pancreas cell is genetic information relating to insulin stored? Describe briefly how it is stored. [5]
  - (b) Where and how does insulin synthesis take place in these cells? Use diagrams in your answer. [10]
  - (c) What is the role of insulin in metabolism? [3]
  - (d) State the name and describe the nature of the condition where a person has a mutant gene which makes insulin ineffective. [2]
2. Give detailed information about the pollen of Angiosperms, showing
  - (a) how it is produced and where it is formed, giving a drawing of the flower parts concerned. [6]
  - (b) a diagram of pollen structure. [2]
  - (c) what happens between pollination and the formation of a seed [3], giving a detailed drawing of the female flower parts concerned in seed production. [9]
3.
  - (a) Blood can be grouped according to the ABO system. What blood factors give rise to each group? You should use a table to give the principal information. [5]
  - (b) Why is it necessary to know the blood groups of people involved in a blood transfusion? Which group is the universal donor and which is the universal recipient? [5]
  - (c) Taking this ABO system as an example, define the phenomena of multiple alleles, codominance, dominance and recessiveness. [7]
  - (d) How do these phenomena influence the resultant phenotypes in Mendel's first law? [3]
4. Explain the properties of chloroplasts in vascular plants
  - (a) by describing their structure with the aid of an annotated diagram. [7]
  - (b) by giving details of the functioning of these organelles when plants are subjected to light. [11]
  - (c) showing how they function when plants are in darkness. [2]

5.
  - (a) Describe the molecular structure of cell membranes as understood today, illustrating your description with a well labelled diagram. [4]
  - (b) List the different membranes which may be found in (i) prokaryotic cells and (ii) in eukaryotic cells. [11]
  - (c) Do phagocytosis and pinocytosis take place in all types of cells? Compare the two phenomena and state the role played by primary lysosomes. [5]
6.
  - (a) What is a mutation? Briefly define the different types of mutation. [9]
  - (b) Write an essay on the role of mutations and recombinations leading to variation of individuals [6], and their role in the evolution of species. [5]
7.
  - (a) Draw a diagram of the pituitary gland and its connections, clearly showing the origin of its different parts. [4]
  - (b) State two hormones produced **by each** of the parts of the gland. [4]
  - (c) Describe the principal effects of the hormones mentioned. [12]
8.
  - (a) Give clearly annotated diagrams to compare the structures of an Amphibian blastula and a Mammalian blastocyst. [4]
  - (b) Describe the development of each until the end of gastrulation, illustrated by simple diagrams. [14]
  - (c) Can the blastula and the blastocyst be considered as strictly homologous stages? Justify your answer. [2]
9. Write an essay on the fate of a nitrogen atom in a plant from the time it is absorbed by a root until it is incorporated into a protein in the apical meristem of a shoot. Your essay should contain explanations relating to
  - (a) the general fate of nitrogen in the plant. [2]
  - (b) absorption of nitrogen by the plant. [6]
  - (c) production of amino acids. [3]
  - (d) transport of organic nitrogen compounds. [2]
  - (e) production of proteins in the meristem cell, briefly explained. [7]



10. Identify and describe the biochemical and physiological processes involved in the following statements.
    - (a) Bacteria in the stomach of the sheep convert cellulose into glucose. [4]
    - (b) Bacteria in the stomach of the sheep metabolise part of the glucose into acetate. [4]
    - (c) Sheep assimilate acetate, acetate is metabolised into acetyl coenzyme A [2], which is used as a substrate for cell respiration. [10]
  11. The first law of thermodynamics states that energy can be transformed from one form into another but it can never be created or destroyed. Explain how ecosystems obey this law [10], indicating the different sources of energy playing a part in these systems. [10]
  12. In 1959 E. P. Odum described ecology as 'the study of the structure and function of nature'. Explain this by using suitable named examples when giving definitions [4] and describing the chosen structures [8] and functions. [8]
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